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PAPER DIAPER

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Claims

1. A paper diaper characterized in that it is loaded with a colorless or light-colored moisture coloring material that has a basic dye, a coloring agent that can exhibit color by contacting said dye, and a desensitizer as indispensable components.

2. The paper diaper mentioned in Claim 1 where the desensitizer is polyolefin glycol and/or a surfactant.

Detailed explanation of the invention

Industrial application field

The present invention relates to a paper diaper. More specifically, it relates to a paper diaper that can indicate evacuation, e.g., urination or defecation.

Prior art

Paper diapers are constituted with a liquid-permeable surface sheet composed of a nonwoven fabric, such as polyester or polypropylene, a liquid-impermeable back surface sheet composed of a film such as polyethylene or polypropylene, and a moisture-absorbing body composed of cottony pulp, moisture absorbent paper, a highly moisture absorbent macromolecular substance, or the like inserted between them, and are widely used for infants or the elderly in hospitals.

In the case of infants, the amount of urination at one time is slight and there is little back wetting (return of urine), so the diaper is replaced after several urinations. The time to replace it is determined by sensing, e.g., feeling the diaper with the hand or how heavy the diaper feels. The time to replace the diaper may sometimes be off because of incorrect feeling.

In the case of adults, the amount of urination at one time is great, and particularly in the case of adults with dementia or deaf-mutes, it would be desirable to be able to determine this from the appearance while the diaper is still being worn.

In order to solve such problems, interposing litmus paper on the inside of a paper diaper (Japanese Kokai Utility Model No. Sho 59[1984]-24705), or interposing an indicator chemical that turns color or changes color between the pH of 5.9-7.0 of urine (Japanese Kokai Utility Model No. Sho 60[1985]-71604) have been tried, but the test chemicals are expensive, and the manufacturing process is also complicated.

Problems to be solved by the invention

The purpose of this invention is to provide a paper diaper that can indicate evacuation from the external appearance with the diaper in place.

Means to solve the problems

This invention is a paper diaper that is characterized in that it is loaded with a colorless or light-colored moisture coloring material that has a basic dye, a coloring agent that can exhibit color by contacting said dye, and a desensitizer as indispensable components.

Operation

This invention is characterized in that it uses a moisture coloring material with a basic dye, a coloring agent that can exhibit color by contacting said dye, and a desensitizer as indispensable components.

The following are exemplified as possible basic dyes.

Included are: 3,3-bis(p-dimethylaminophenyl)-6-dimethylaminophthalide,
3,3-bis(p-dimethylaminophenyl) phthalide,
3-(p-dimethylaminophenyl)-3-(1,2-dimethylindol-3-yl) phthalide,
3-(p-dimethylaminophenyl)-3-(2-methylindol-3-yl) phthalide,
3,3-bis(1,2-dimethylindol-3-yl)-5-dimethylaminophthalide,
3,3-bis(1,2-dimethylindol-3-yl)-6-dimethylaminophthalide,
3,3-bis(9-ethylcarbazol-3-yl)-6-dimethylaminophthalide,
3,3-bis(2-phenylindol-3-yl)-6-dimethylaminophthalide,
3-p-dimethylaminophenyl-3-(1-methylpyrrol-3-yl)-6-dimethylaminophthalide or other trialkylmethane dye, 4,4'-bis-dimethylaminobenzohydryl benzyl ether,
N-halophenylleucoauramine, N-2,4,5-trichlorophenylleucoauramine or other diphenylmethane dye, benzoylleucomethylene blue, p-nitrobenzoylleucomethylene blue or other thiazine dye,
3-methyl-spiro-dinaphthopyran, 3-ethyl-spiro-dinaphthopyran, 3-phenyl-spiro-dinaphthopyran,
3-benzyl-spiro-dinaphthopyran, 3-methylnaphtho (6'-methoxybenzo) spiropyran,
3-propyl-spiro-dibenzopyran or other spiro dye, rhodamine-B anilinolactam, rhodamine (p-nitroanilino)lactam, rhodamine (o-chloroanilino)lactam or other lactam dye,
3-dimethylamino-7-methoxyfluoran, 3-diethylamino-6-methoxyfluoran,
3-diethylamino-7-methoxyfluoran, 3-diethylamino-7-chlorofluoran,
3-diethylamino-6-methyl-7-chlorofluoran, 3-diethylamino-6,7-dimethylfluoran,
3-(N-ethyl-p-toluidino)-7-methylfluoran, 3-diethylamino-7-(N-acetyl-N-methylamino)fluoran,
3-diethylamino-7-(N-methylamino)fluoran, 3-diethylamino-7-dibenzylaminofluoran,
3-diethylamino-7-(N-methyl-N-benzylamino)fluoran,
3-diethylamino-7-(N-chloroethyl-N-methylamino)fluoran,
3-diethylamino-7-diethylaminofluoran, 3-(N-ethyl-p-toluidino)-6-methyl-7-phenylaminofluoran,
3-(N-ethyl-p-toluidino)-6-methyl-7-(p-toluidino)fluoran,
3-diethylamino-6-methyl-7-phenylaminofluoran,

3-dibutylamino-6-methyl-7-phenylaminofluoran,
3-diethylamino-7-(2-carbomethoxyphenylamino)fluoran,
3-(N-cyclohexyl-N-methylamino)-6-methyl-7-phenylaminofluoran,
3-pyrrolidino-6-methyl-7-phenylaminofluoran, 3-piperidino-6-methyl-7-phenylaminofluoran,
3-diethylamino-6-methyl-7-(2,4-dimethylamino)fluoran,
3-diethylamino-7-(o-chlorophenylamino)fluoran,
3-dibutylamino-7-(o-chlorophenylamino)fluoran,
3-pyrrolidino-6-methyl-7-(p-butylphenylamino)fluoran,
3-(N-methyl-N-n-amylamino)-6-methyl-7-phenylaminofluoran,
3-(N-ethyl-N-n-amylamino)-6-methyl-7-phenylaminofluoran, 3-(N-ethyl-N-isoamyl amino)-6-methyl-7-phenylaminofluoran,
3-(N-methyl-N-n-hexylamino)-6-methyl-7-phenylaminofluoran,
3-(N-ethyl-N-n-hexylamino)-6-methyl-7-phenylaminofluoran,
3-(N-ethyl-N-β-ethylhexylamino)-6-methyl-7-phenylaminofluoran or other fluoran dye. Of course, it is not restricted to these dyes, and two or more dyes can also be used together.

In this invention, for the coloring agent used in combination with the aforementioned basic dye, substances as given below which are known in the fields of pressure sensitive copy paper or thermosensitive paper, for example, are exemplified.

Included are: 4-tert-buylphenol, α-naphthol, β-naphthol, 4-acetylphenol, 4-tert-octylphenol, 4,4'-sec-butylidene phenol, 4-phenylphenol, 4,4'-dihydroxydiphenylmethane, 4,4'-isopropylidene diphenol, hydroquinone, 4-4'-cyclohexylidene diphenol 4,4'-dihydroxyphenyl sulfide, 4,4'-thiobis (6-tert-butyl-3-methylphenol), 4,4'-dihydroxydiphenylsulfone, hydroquinone monobenzyl ether, 4-hydroxybenzophenone, 2,4-dihydroxybenzophenone, 2,4,4'-trihydroxybenzophenone, 2,2',4,4'-tetrahydroxybenzophenone, 4-hydroxydimethyl phthalate, 4-hydroxymethyl benzoate, 4-hydroxyethyl benzoate, 4-hydroxypropyl benzoate, 4-hydroxy-sec-butyl-benzoate, 4-hydroxypentyl benzoate, 4-hydroxyphenyl benzoate, 4-hydroxybenzyl benzoate, 4-hydroxytolyl benzoate, 4-hydroxychlorophenyl benzoate, 4-hydroxyphenylpropyl benzoate, 4-hydroxyphenethyl benzoate, 4-hydroxy-p-chlorobenzyl benzoate, 4-hydroxy-p-methoxybenzyl benzoate, novolac type phenol resin, phenol polymer or other phenolic compounds; benzoic acid, p-tert-butyl benzoate, trichlorobenzoate, terephthalic acid, 3-sec-butyl-4-hydroxybenzoate, 3-cyclohexyl-4-hydroxybenzoate, 3,5-dimethyl-4-hydroxybenzoate, salicylic acid, 3-isopropylsalicylic acid, 3-tert-butylsalicylic acid, 3-benzylsalicylic acid, 3-(α-methylbenzyl)salicylic acid, 3-chloro-5-(α-methylbenzyl)salicylic acid, 3,5-di-tert-butylsalicylic acid, 3-phenyl-5-(α,α-dimethylbenzyl)salicylic acid, 3,5-di-(α-methylbenzyl)salicylic acid or other aromatic carboxylic acid; organic acid substances, such as salts of these aromatic carboxylic acids

and polyvalent metals, such as zinc, magnesium, aluminum, calcium, titanium, manganese, tin, or nickel. Of course, two or more of these coloring agents can also be used together as necessary.

The basic dye and coloring agent are used by appropriately selecting so that the desired coloring is obtained. The mixing ratio of the basic dye and the coloring agent should also be adjusted to around 50-600 parts by weight, and preferably 100-400 parts by weight coloring agent, to 100 parts by weight dye.

The desensitizer may be a substance that prevents a coloring reaction by the basic dye and coloring agent and that dissolves in water. A surfactant or polyolefin glycol that dissolves easily in water is particularly preferable.

Concrete examples include: polyethylene glycol, polypropylene glycol, polyethylene propylene glycol, polyoxyethylene alkyl ether sodium sulfate, polyoxyethylene alkyl ether triethanolamine sulfate, polyoxyethylene alkylphenol ether sodium sulfate, polyoxyethylene lauryl ether, polyoxyethylene oleyl ether, polyoxyethylene nonyl phenyl ether, polyoxyethylene sorbitan monolaurate, or polyethylene glycol monostearate.

The amount of desensitizer used cannot be stated unconditionally, depending on the type of base material, basic dye, and coloring agent used, but it should be in the range of 50-2000 parts by weight to 100 parts by weight coloring agent.

In this invention, the mixing of the three components – basic dye, coloring agent and desensitizer – forms a particularly important constitution. The mechanism whereby the indispensable three-component system produces color by the adhesion of urine is believed to occur because a phenomenon as described below occurs. Namely, when the water in the urine adheres to the three-component system, the desensitizer dissolves in the water. Because of this, the concentration of desensitizer in the three components decreases and the function of hindering a coloring reaction between the basic dye and the coloring agent decreases. The result is that a coloring reaction occurs between said dye and coloring agent and a visible image appears.

The water coloring agent may be prepared as a coating solution using water as the dispersing body, for example, and dispersing the dye and coloring agent together or separately with a stirring/pulverizing machine, such as a ball mill, attriter or sand grinder, or by emulsifying the dye and/or coloring agent.

In the coating solution, starches, hydroxyethylcellulose, methylcellulose, carboxymethylcellulose, gelatin, casein, gum Arabic, polyvinyl alcohol, styrene-anhydrous malic acid copolymer salt, styrene-butadiene copolymer emulsion, or other adhesives can also be added for the purpose of improving adhesion with the base material, for example. Organic or inorganic pigments or fragrances, deodorizers, antifoaming agents, ultraviolet absorbers, or other auxiliary agents can also be added as necessary.

As the method for loading the moisture coloring material in the paper diaper, it should be furnished so that the color is visible when worn. It may be furnished by applying, impregnating, etc., into the surface of the moisture-absorbing body toward the back surface sheet, or the surface of the back surface sheet on the absorbent body side. A sheet, such as paper, woven fabric, nonwoven fabric, or synthetic film that is coated or impregnated with the coating solution could also be inserted between the moisture-absorbing body and the back surface sheet.

As for the method for coating or impregnating of the moisture coloring material, in addition to coating by spraying or brushing, it may be furnished on the sheet before molding with a known means, such as a coating machine, for example, an air-knife coater, blade coater, bar coater, gravure coater, or curtain coater, or a printer, such as a letterpress, intaglio, lithograph, or mimeograph.

Application examples

This invention will be explained more concretely below by giving application examples, but it is not limited to them, of course. Also, unless specifically noted, parts and % in the examples indicate parts by weight and wt%, respectively.

Application Example 1

(1) Preparation of the moisture coloring material

35% Aqueous dispersion of 3,3-bis(p-dimethylaminophenyl) -6-dimethylaminophthalide pulverized finely with a sand mill 30 parts

38% Aqueous dispersion of 3,5-di-(α-methylbenzyl) zinc salicylate finely pulverized with a sand mill 55 parts

25% Aqueous solution of polyoxyethylene nonyl phenol ether (made by Kao, trade name: Emulgen 935) 200 parts

The aforementioned components were stirred together and a moisture coloring material coating solution was obtained.

(2) Production of paper diaper

The coating solution was applied by spraying to one side of a moisture-absorbing body composed of 640 g/cm^2 cottony pulp that contains a polyacrylic acid highly moisture absorbent macromolecule, it was dried at 50°C for 20 sec, and a white moisture coloring material layer was obtained. The coating amount here was 4.0 g/m^2 in dry weight.

The coated side of said moisture-absorbing body was placed on a polyethylene sheet so that it was facing said sheet, and a surface sheet composed of nonwoven fabric was additionally placed on it to obtain a paper diaper.

When urine was added to the surface sheet side of the paper diaper, the coating layer to which urine adhered turned blue, and the portion that had absorbed urine and the portion that had not could be clearly determined from the back surface (polyethylene sheet side).

Application Example 2

The coating solution produced with Application Example 1 was applied with a blade to 19 g/m^2 base paper, dried at 80°C for 30 sec, and a moisture absorbent sheet with a white moisture coloring material layer was obtained. The coating amount here was 3.5 g/m^2 in dry weight.

Said sheet was laid on a polyethylene sheet with the coated side facing the polyethylene sheet. Next a cottony pulp moisture-absorbing body containing an acrylic acid highly moisture absorbent macromolecule and a surface sheet composed of nonwoven fabric were sequentially layered on and a paper diaper was obtained.

When urine was added to the surface sheet side of said diaper, the moisture absorbent paper where urine adhered turned blue. The amount of urine added was varied at 10, 20 and 30 cc, and the colored surface area after being left for 5 min with a 10-g/m^2 load on the surface sheet side was 5, 20 and 50 cm^2, respectively.

Application Example 3

(1) Preparation of the moisture coloring material

35% Aqueous dispersion of 3,3-bis(p-dimethylaminophenyl)-6-dimethylaminophthalide finely pulverized with a sand mill 30 parts

38% Aqueous dispersion of 3,5-di-(α-methylbenzyl) zinc salicylate finely pulverized with a sand mill 55 parts

50% Aqueous solution of polyethylene glycol #1000 (molecular weight: 1000) 145 parts

49% Styrene-butadiene copolymer latex 100 parts

The aforementioned components were stirred together and a coating solution was obtained.

(2) Production of paper diaper

This coating solution was applied to synthetic paper (made by Oji Yuka, trade name Yupo, basis weight: 110 g/m^2) with a wire bar. 40 g/m^2 gauze was laid directly [on it], it was roll pressed, dried at 80°C for 30 sec, and then it was peeled off and a sheet with a white moisture coloring material layer was obtained. The sheet was handled the same as in Application Example 2 to obtain a paper diaper.

When urine was added to the surface sheet of the diaper, the moisture coloring material layer of the gauze where urine adhered turned blue, and the portion that had absorbed urine and the portion that had not could clearly be differentiated from the back surface.

Application Example 4

(1) Preparation of moisture coloring material

35% Aqueous dispersion of 3,3-bis(p-dimethylaminophenyl)-6-dimethylaminophthalide finely pulverized with a sand mill 30 parts

38% Aqueous dispersion of 3,5-di-(α-methylbenzyl) zinc salicylate finely pulverized with a sand mill 55 parts

50% Aqueous solution of polyethylene glycol #1000 (molecular weight: 1000) 60 parts

48% Styrene-butadiene copolymer latex 100 parts

30% Aqueous dispersion of calcium carbonate (oil absorption: 95 mL/100 g) 70 parts

The aforementioned components were stirred together and a moisture coloring material coating solution was obtained.

(2) Production of paper diaper

This coating solution was applied to the corona-treated surface of polypropylene film (made by Toyo Boseki, trade name: Pylen Film OT, thickness: 20 μm) with a wire bar, dried at 80°C for 30 sec, and a film (back surface sheet) with a white moisture coloring material layer was obtained. The coating amount here was 3.5 g/m^2 in dry weight.

A cottony pulp moisture-absorbing body containing an acrylic acid highly moisture absorbent macromolecule and a surface sheet composed of a nonwoven fabric were sequentially layered on the coated side of said film and a paper diaper was obtained.

When urine was added to the surface sheet side of said diaper, the polypropylene film where urine adhered turned blue, and the portion that had absorbed urine and the portion that had not could clearly be differentiated from the back surface.

Effect

With this invented paper diaper, the presence or absence of evacuation can be determined without touching by the presence or absence of coloring from the external appearance while worn, so it is hygienic. Furthermore, how wet the diaper is can be seen as the size of the colored surface area, so the diaper replacement time can be determined precisely. The moisture coloring material referred to with this invention can be manufactured very inexpensively, so it is extremely useful industrially.

Brief description of the figures

Figures 1-4 are cross sections that show one application example of this invented paper diaper. Figure 1 is a cross section that explains when the moisture coloring material layer is furnished on the back surface sheet of the moisture-absorbing body, Figure 2 when a sheet that has a moisture coloring material layer is placed between the absorbent body and the back surface sheet, Figure 3 when a moisture coloring material layer is furnished on the entire surface of the back surface sheet toward the absorbent body, and Figure 4 when a moisture coloring material layer is furnished on part of the back surface sheet toward the absorbent body.

(1) ... Paper diaper
(2) ... Surface sheet
(3) ... Moisture-absorbing body
(4) ... Back surface sheet
(5) ... Moisture coloring material layer
(6) ... Sheet

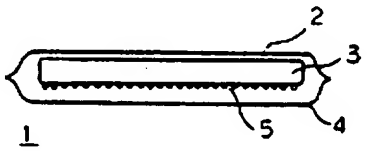

Figure 1

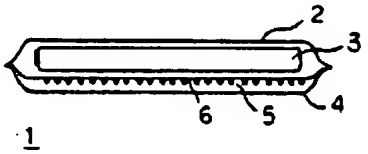

Figure 2

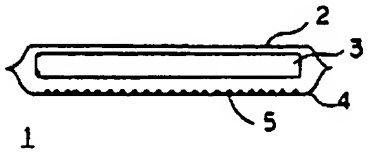

Figure 3

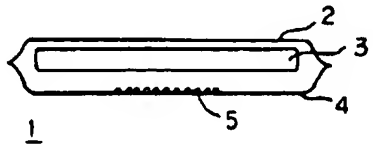

Figure 4